

Claims

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1. A fluidized bed system comprising a first fluidized bed, means to feed solids into said first fluidized bed adjacent to a first end of said first fluidized bed and means to feed fluid into said first fluidized bed adjacent to a second end of said first fluidized bed, said second end being remote from said first end so that said solids and said fluid flow in counter current, a second fluidized bed, said second fluidized bed being an entraining fluidized bed wherein a means for introducing solids and a means for introducing fluid into said second bed are both adjacent to one end of said second fluidized bed so that said solids and said fluid introduced into said second bed flow concurrently through said second bed from said one end toward another end of said second fluidized bed remote from said one end, first means connecting said first fluidized bed to said second fluidized bed adjacent to said second end of said first fluidized bed and said one end of said second fluidized bed and second means connecting said first and said second fluidized beds adjacent said first end of said first bed and said other end of said second fluidized bed, said first means connecting being adapted to form a hydraulic seal between said first and second fluidized beds and said second means connecting includes said means to feed solids into said first fluidized bed.
2. A fluidized bed system as defined in claim 1 wherein said first and second fluidized beds are substantially vertical columns.
3. A fluidized bed system as defined in claim 2 wherein said second means connecting said first and said second fluidized beds includes a separator means for separating solids from fluid and exhausting such separated fluid to provide separated solids
4. A fluidized bed system as defined in claim 3 wherein second means connecting said first and said second fluidized beds further includes a washer for washing said solids before they are fed into said first end of said first fluidized bed.
5. A fluidized bed system as defined in claim 2 wherein said first means connecting said first and said second fluidized beds includes a second washer for washing solids adjacent to said second end of said first fluidized before they are introduced into said second fluidized bed.

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6. A fluidized bed system as defined in claim 3 wherein said first means connecting said first and said second fluidized beds includes a second washer for washing solids adjacent to said second end of said first fluidized before they are introduced into said second fluidized bed.

5 7. A fluidized bed system as defined in claim 4 wherein said first means connecting said first and said second fluidized beds includes a second washer for washing solids adjacent to said second end of said first fluidized before they are introduced into said second fluidized bed.

10 8. A fluidized bed system as defined in claim 1 wherein said first fluidized bed is an absorber for separating ionic products of interest and said second fluidized bed is a desorber for desorption of ionic products and said solids are ion exchange particles. said second means for connecting including said means to feed solids into said first fluidized bed.

15 *cont* 9. A fluidized bed system as defined in claim 2 wherein said first fluidized bed is an absorber for separating ionic products of interest and said second fluidized bed is a desorber for desorption of ionic products and said solids are ion exchange particles. said second means for connecting including said means to feed solids into said first fluidized bed.

20 10. A fluidized bed system as defined in claim 3 wherein said first fluidized bed is an absorber for separating ionic products of interest and said second fluidized bed is a desorber for desorption of ionic products and said solids are ion exchange particles. said second means for connecting including said means to feed solids into said first fluidized bed.

25 11. A fluidized bed system as defined in claim 4 wherein said first fluidized bed is an absorber for separating ionic products of interest and said second fluidized bed is a desorber for desorption of ionic products and said solids are ion exchange particles. said second means for connecting including said means to feed solids into said first fluidized bed.

30 12. A fluidized bed system as defined in claim 5 wherein said first fluidized bed is an absorber for separating ionic products of interest and said second fluidized bed is a desorber for desorption of ionic products and said solids are ion

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exchange particles. said second means for connecting including said means to feed solids into said first fluidized bed.

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13. A fluidized bed system as defined in claim 6 wherein said first fluidized bed is an absorber for separating ionic products of interest and said second fluidized bed is a desorber for desorption of ionic products and said solids are ion exchange particles. said second means for connecting including said means to feed solids into said first fluidized bed.

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14. A fluidized bed system as defined in claim 7 wherein said first fluidized bed is an absorber for separating ionic products of interest and said second fluidized bed is a desorber for desorption of ionic products and said solids are ion exchange particles. said second means for connecting including said means to feed solids into said first fluidized bed.

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15. A method for recovering ionic products of interest comprising passing ion exchange particles in countercurrent flow with a feed stream of a first fluid through a first fluidized bed for adsorption of ionic products of interest from said feed stream of said first fluid, transferring said particles with adsorbed ionic products of interest from said first fluidized bed to a second fluidized bed and passing said ion exchange particles with absorbed ionic products in co-current flow with an extract buffer of a second fluid through said second fluidized bed for desorption of said adsorbed ionic products of interest, separating said second fluid containing said ionic products of interest desorbed from said ion exchange particles by said second fluid to provide regenerated ion exchange particles and returning said regenerated ion exchanged particles into said first fluidized bed to flow in countercurrent with said first fluid.

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16. A method as defined in claim 15 wherein said ion exchange particles with absorbed ionic products are washed before being introduced into said second fluidized bed

17. A method as defined in claim 16 wherein said regenerated ion exchange particles are washed before being returned to said first fluidized bed

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18. A method as defined in claim 16 wherein said ionic product is a protein and said first fluid is a fermentation broth.

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19. A method as defined in claim 16 wherein said ionic product is a metal and said first fluid is sea water.
20. A method as defined in claim 16 wherein said ionic product is an enzyme and said first fluid is dextrose syrup.